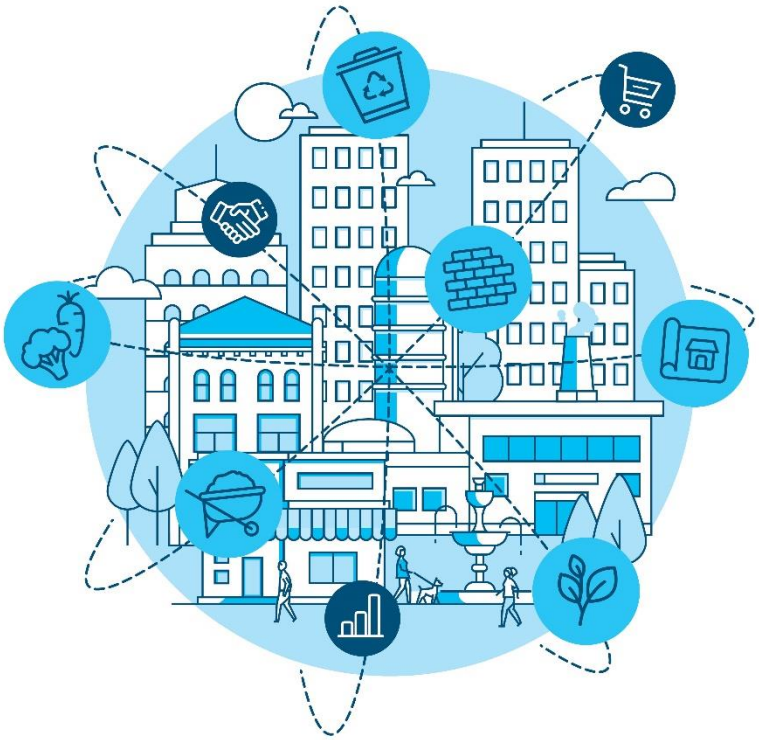
Circular soil handling in Høje-Taastrup

Extract from the Demonstration Report

Municipality of Høje-Taastrup, Denmark



Contents

This text describes Høje-Taastrup's experience in handling soil circularly in the development of Taastrupgaard. The sections come from Høje-Taastrup's CityLoops demonstration report available here.

Circular soil management

The focus of this action is on establishing circular soil management at the city level in order to keep excavation of soil to a minimum and use excess soil locally, thereby reducing handling and transport of soil. Reduced transport of soil will lead to reduced CO2 emissions, increased traffic safety, less wear and tear of roads, reduced particle pollution and less traffic in general.

An instrument for predicting how much soil will be produced at city level was developed and tested. Barriers to reusing soil have been uncovered by interviewing stakeholders. A roadmap for identifying municipal roles and ways of improving circular soil management was developed.

Høje-Taastrup contributed the guidelines for sustainable soil management and assessment of soil reuse potential of excavated soil. In addition, the CO2 calculator was used to illustrate the significant effects that more circular soil management has on emissions.

The overall objectives for circular soil management order of priority are:

1. Reduce excavation during construction projects – leading to a reduction in the amount of excess soil generated
2. Strive for soil balance in projects/urban planning - maximize reuse on site
3. Reuse soil at local sites/projects

Examples from circular soil handling

Nærheden

FB Gruppen, a private developer, is developing a large area for an expected 3000 residents in the eastern part of the urban development area Nærheden in Hedehusene. FB Gruppen performed an early soil calculation in order to be able to plan for reducing amounts of excess soil when developing the area. FB Gruppen saw the benefits for reusing soil, from an economic and sustainability perspective.

The soil calculation is based on planned future terrain elevation, location of future buildings, expected excavation depths etc. In addition, geotechnical drillings were performed in order to estimate the reuse potential of the identified soil types around the area. Furthermore, FB Gruppen performed lime stabilization under future parking areas thus avoiding the need to dig up soil in order to stabilize the ground with filler, further reducing the amounts of excess soil. The soil is reused on site as much as possible to adjust and model the terrain prior to construction.

According to the calculation, more than 90 % of what would have been excess soil is being kept on site in FB Gruppen's area. The estimated amount of excess soil saved is more than 700.000 tons saving an estimated more than 1.000 tons of CO2 – and of course a substantial amount of money depending on market prices for soil deposit and transport.

New city hall and Taastrupgård

Concurrently with the construction of the new city hall the department of properties took over the area in Taastrupgård where eight apartment blocks were demolished to build a new school. In order to modulate the terrain in the area after demolition, a large amount of soil was needed. The project manager for construction of the school and the project manager for the construction of the new city hall realized that the timing would be almost perfect for reusing excess soil from the city hall construction at the area in Taastrupgård where the school was to be built. Therefore, they contacted the CityLoops project manager who is also an authority on soil in the environmental department in order to clarify if there were any legal or other barriers to reusing the soil locally. Since the soil was uncontaminated and geotechnically suitable for the purpose of modulating the terrain, there were no concerns or barriers for reusing the soil.

However, it turned out that the soil had to be stored intermediately for a couple of weeks, which the CityLoops project manager helped find a suitable area for.

Approximately 9.000 tons of soil from the construction of the new city hall was reused in Taastrupgård. CO2 calculations revealed that almost 30 tons of CO2 were saved from transporting the soil a shorter distance.

Lessons learned

- The DGNB criteria with regards to soil played an important role and was an incentive for local reuse. Most DGNB points are given for reuse on site, though some points are also given for keeping soil within a certain distance from the site. The intermediate storage of soil was done to account for discrepancy in timing in order to secure local reuse and thereby get DGNB points.
- Calculations of CO2 savings on soil could easily be applied and are very illustrative and simple– truckloads of soil savings are easy to communicate and understand.

Soil instruments

These soil instruments have been developed and simultaneously tested in the demonstration actions in Høje-Taastrup:

- Soil prognosis: Instrument for prediction of soil production
- Roadmap for soil management
- Guidelines for sustainable soil management and assessment of reuse potential of excavated soils

These instruments are available in the webpage of the CityLoops Replication Package Circular soil handling.

Soil prognosis: Prediction of future excess soil

A prognosis to predict annual expected excavated soil in Høje-Taastrup for 12 years (2020-2031) was carried out. The predictions were based on a business-as-usual scenario, considering a situation where municipal planning and construction activities are performed without paying special attention to reducing the amounts of excavated and excess soil. The prognosis is based on historical analysis and knowledge of upcoming major construction projects that will take place in the future.

Data for the prognosis was collected by the urban planning team and the soil team within the municipality.

NIRAS synthesized the relevant data and carried out the analysis.

YEAR	TON
2020	300.000
2021	250.000
2022	900.000
2023	450.000
2024	200.000
2025	250.000
2026	400.000
2027	250.000
2028	250.000
2029	250.000
2030	90.000
2031	90.000
I alt	3.7 mio. ton

Table 1- Prognosis for expected excess soil from construction and infrastructure projects in Høje-Taastrup municipality

Lessons learned

The prognosis has been useful in several ways:

- Increased awareness of masses of soil being produced and transported in general. Especially if the amounts are converted into truckloads of soil (estimated 35 tons of soil per truck), it becomes very clear that soil is an important parameter to consider – not solely as a result of CO2 emissions, but also in terms of traffic safety and volume, road wear and tear, noise impact, etc.
- Early awareness of the expected amount of excess soil at certain development areas. Being able to pinpoint the expected amounts of excess soil at an early stage often is advantageous, since the developer can take this information into account in the planning stage of the project, thereby increasing the opportunities to try to reduce amounts of excess soil being dug up and reusing as much as possible on site.
- Possibility of measuring impact when circular soil handling is prioritized in new development areas. The actual amounts of soil can easily be compared to the prognosis and a simple calculation will reveal how much soil is being kept on site. The CO2 calculator will easily reveal the CO2 emissions saved.
- Experience from development projects taking place since 2020 revealed that the amounts of excess soil on already developed areas being transformed is underestimated in the prognosis. This feedback was given back to NIRAS, who in future similar prognosis will adjust the calculations and estimates.
- Urban development plans are regularly being adjusted and changed. Therefore, it is recommended that the prognosis be updated for example every 4 years to maintain a realistic prognosis that is as useful as possible.

Identification of barriers to circular soil handling

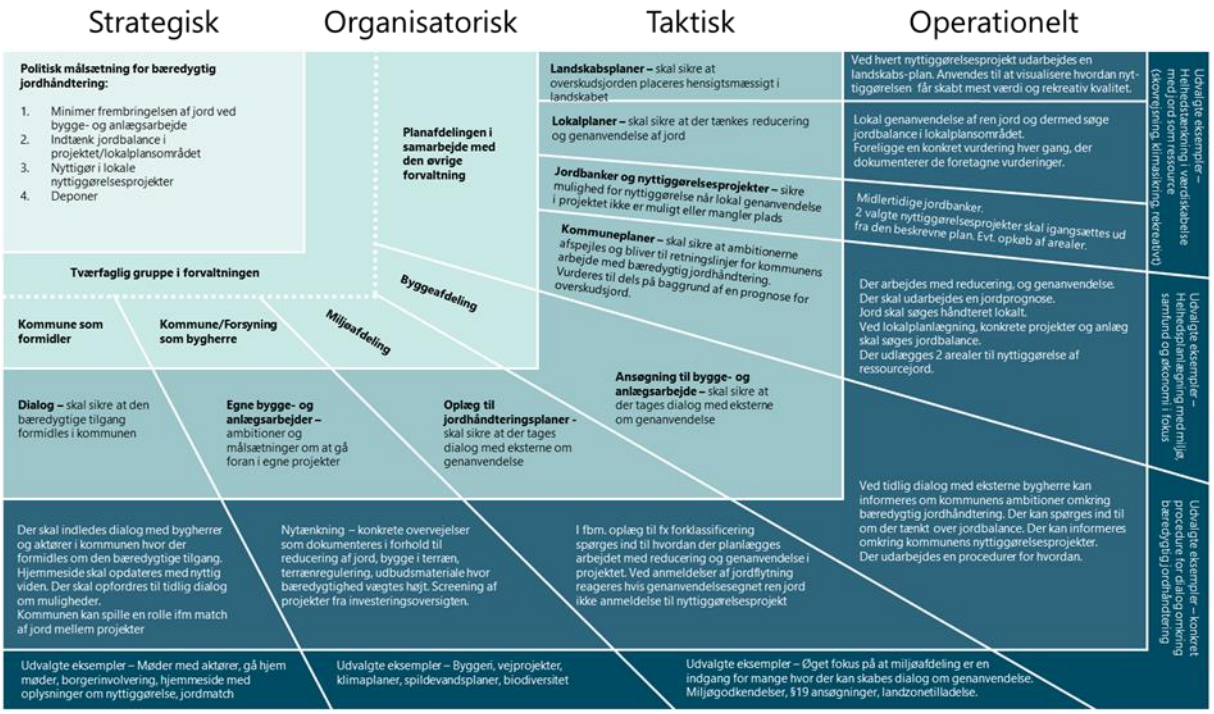
A series of stakeholders in the market were interviewed about barriers for on site soil reuse and circular soil handling.

Lessons learned

- DGNB criteria are a great incentive for reusing soil, since most points are given for reuse on site, though some points are also given for keeping soil within a certain distance from the site.
- Furthermore, in the urban planning process it is very important to designate an available nearby storage place - as otherwise the soil will be transported off site.
- In addition, tendering is an important factor. If the tendering leaves no opportunity for reusing soil, the soil will be handled as usual, thus being transported off site.
- It is crucial to consider soil management at early stages in every project if soil circularity is to be increased. If it is considered as an afterthought, often the project is planned in such a way that the soil is dug or used in the wrong order to be able to use what is already on site. Simply taking soil into account enables it to be factored into the planning.

Roadmap for soil management

The collaborative learning network for circular soil management was set up by the capital region of Denmark in cooperation with Gate21 and consultant NIRAS. A roadmap was developed as a diagram to provide an overview of the strategically anchored effect that a municipality has on soil management. The roadmap illustrates the different roles that a municipal organization has on soil management - land owner, construction client, urban planning and development, authorities etc. Tactical and operational opportunities are identified in relation to each organizational role to identify where the potential for improvement is in the specific organization.



General road map for circular soil management in Denmark.

In Høje-Taastrup the roadmap is a dynamic document and thus, there is no final version of it. Outputs from CityLoops workshops and experiences are continuously put into the roadmap. The sustainability strategy and action plan will also further develop the roadmap and set the strategic goal.

Guidelines for sustainable soil management and assessment of reuse potential of excavated soils

Experiences from urban development projects in both Roskilde and Høje-Taastrup municipalities together with learnings from the interviews and from the soil prognosis and the

roadmap for soil management has been turned into a set of guidelines: Guidelines for Sustainable Soil Management and Assessment of Soil Reuse Potential of Excavated Soils

The guidelines describe an overall approach to sustainable soil management and a description of potential ways of using soils frequently excavated in relation to urban development and construction works in Denmark.

Circular soil handling – a part of the sustainability strategy

Partly as a result of CityLoops a cross organizational sustainability group was established in Høje-Taastrup. The sustainability group is an inspiration group where employees dedicated to sustainability inspire each other and share experiences across the organization.

The sustainability group is responsible for developing a city-wide sustainability strategy in which circular soil management will be included.

The municipal sustainability strategy contains 8 overall themes, one of which is material resources, including the overall objectives for circular soil management. An action plan will be connected to the sustainability strategy.

The experiences and tools from circular soil management in CityLoops as well as outputs from CityLoops workshop supports and feeds directly into the sustainability strategy and action plan at different levels:

- The prognosis illustrates and emphasizes the need for circular soil management and can furthermore be used in the action plan on a project level.
- Examples of circular soil management illustrate how circular soil management can be performed and serves as inspiration
- The guidelines for circular soil management are used directly in the action plan
- The roadmap clearly identifies at which levels the municipality has influence on soil management and which municipal department should be responsible for each action related to the strategy.

CITYLOOPS

CityLoops is an EU-funded project focusing on construction and demolition waste (CDW), including soil, and bio-waste, where seven European cities are piloting solutions to be more circular.

Høje-Taastrup and Roskilde (Denmark), Mikkeli (Finland), Apeldoorn (the Netherlands), Bodø (Norway), Porto (Portugal) and Seville (Spain) are the seven cities implementing a series of demonstration actions on CDW and soil, and bio-waste, and developing and testing over 30 new tools and processes.

Alongside these, a sector-wide circularity assessment and an urban circularity assessment are to be carried out in each of the cities. The former, to optimise the demonstration activities, whereas the latter to enable cities to effectively integrate circularity into planning and decision making. Another two key aspects of CityLoops are stakeholder engagement and circular procurement.

CityLoops started in October 2019 and will run until September 2023.

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